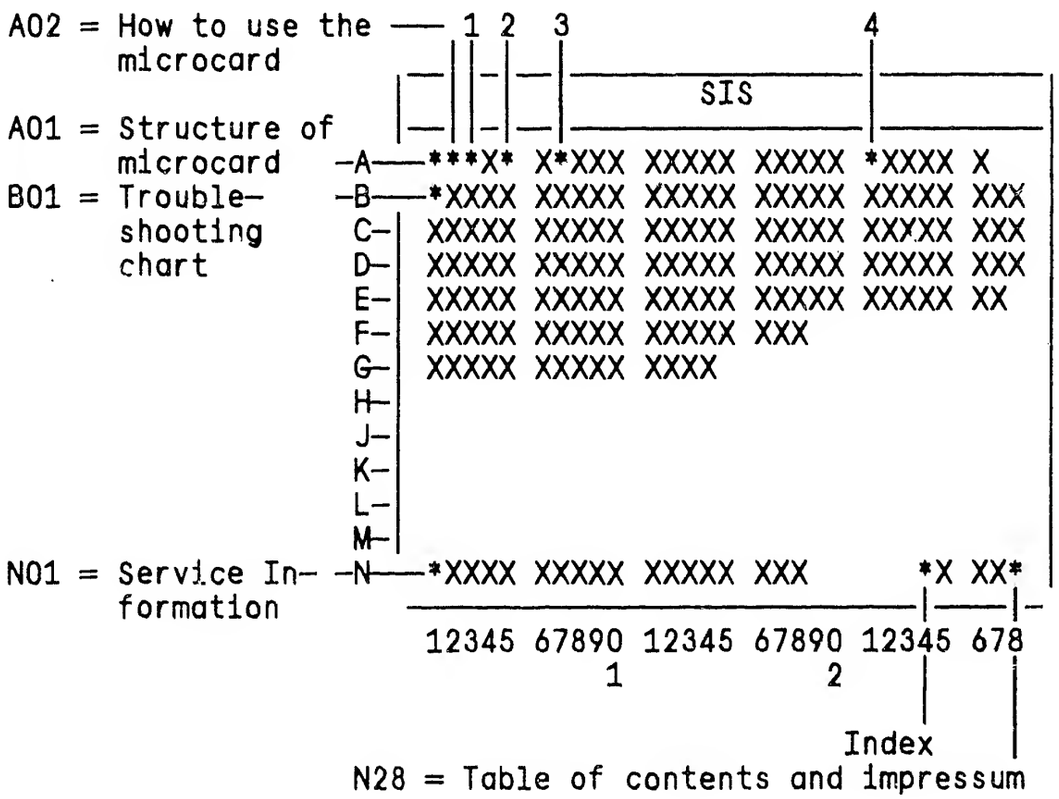
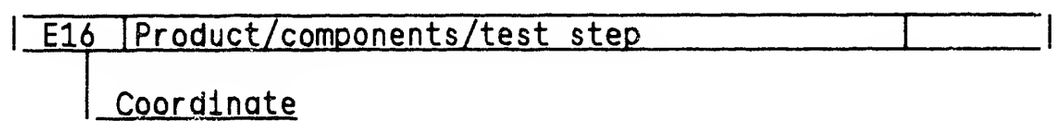
## STRUCTURE OF MICROCARD (BASIC INSTRUCTIONS)



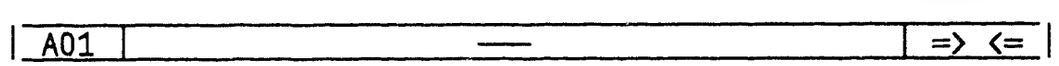

1 = Special features
2 = Safety and precautionary measures
3 = Test equipment and tools
4 = Installation position of components

a. Read from left to right.

b. Title of coordinate (appears on each coordinate).




c. Limits of section


## HOW TO USE THIS MICROCARD

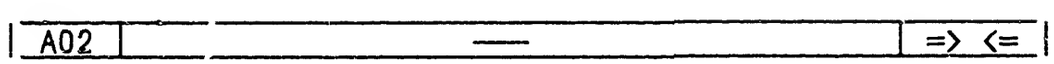
Trouble-shooting instructions for

System Car Pilot

Descriptions, photos, terminal designations and special features refer to vehicle:

BMW 524 td

These instructions are detailed trouble-shooting instructions and apply to the Car Pilot in any passenger-car vehicle.



SPECIAL FEATURES

The Car Pilot has been installed in certain passenger cars since mid-1987.

2.Rapid diagnosis chart

The following rapid diagnosis chart makes it possible for the experienced expert to quickly check the system with a commercially available multimeter and 2 test leads KDZS 0004 or KDZS 0005.

The contents of this chart are limited to the following:

* Sequence of test steps
* Test instructions and test specifications (readings on multimeter).
* References to coordinates of the respective detailed testing and trouble-shooting program.

If detailed information and instructions are necessary, always proceed according to the trouble-shooting program starting on Coordinate C1.

R e q u i r e m e n t s  f o r  t e s t i n g :

* Check customer complaints (check operation of Car Pilot according to operating instructions)
* Electrical system (fuses, battery voltage) O.K.
* Plug connected to magnetic-field sensor

The ignition must be off before disconnecting plug-in connections.

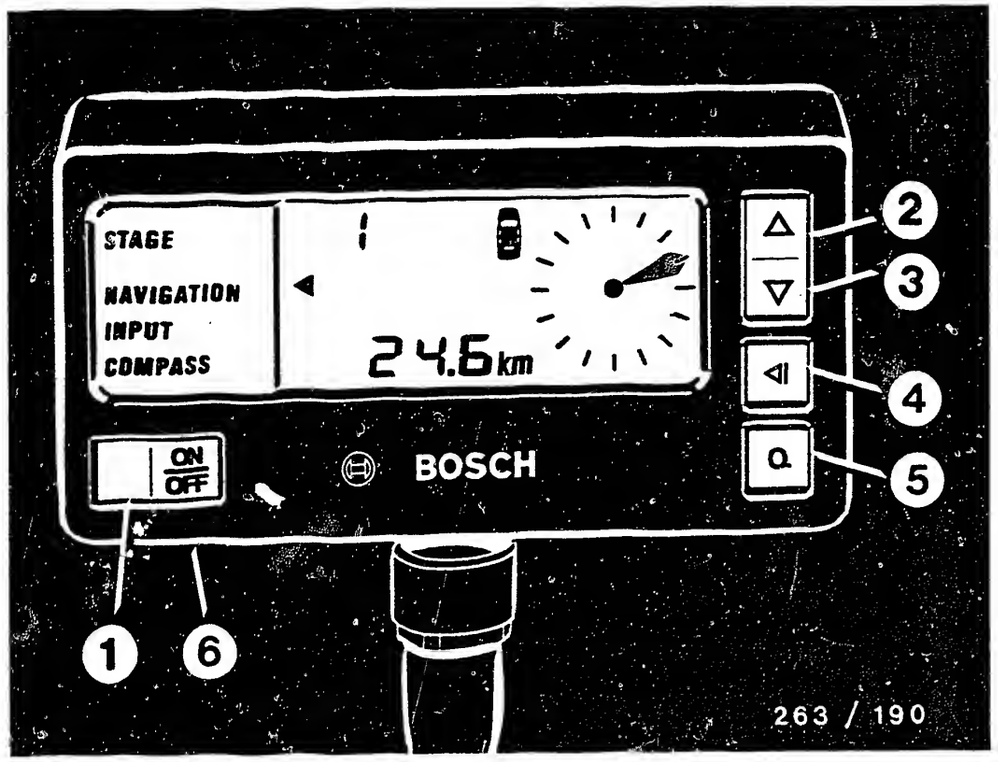


General introduction

Since mid-1987 Bosch has been supplying a retrofittable navigational system that can be installed in passenger cars.

The navigational system consists of the following components:

* Navigational system with integrated keyboard and display unit
* Electronic earth's-magnetic-field sensor
* Distance-impulse transmitter
* Polar-coordinate measuring instrument

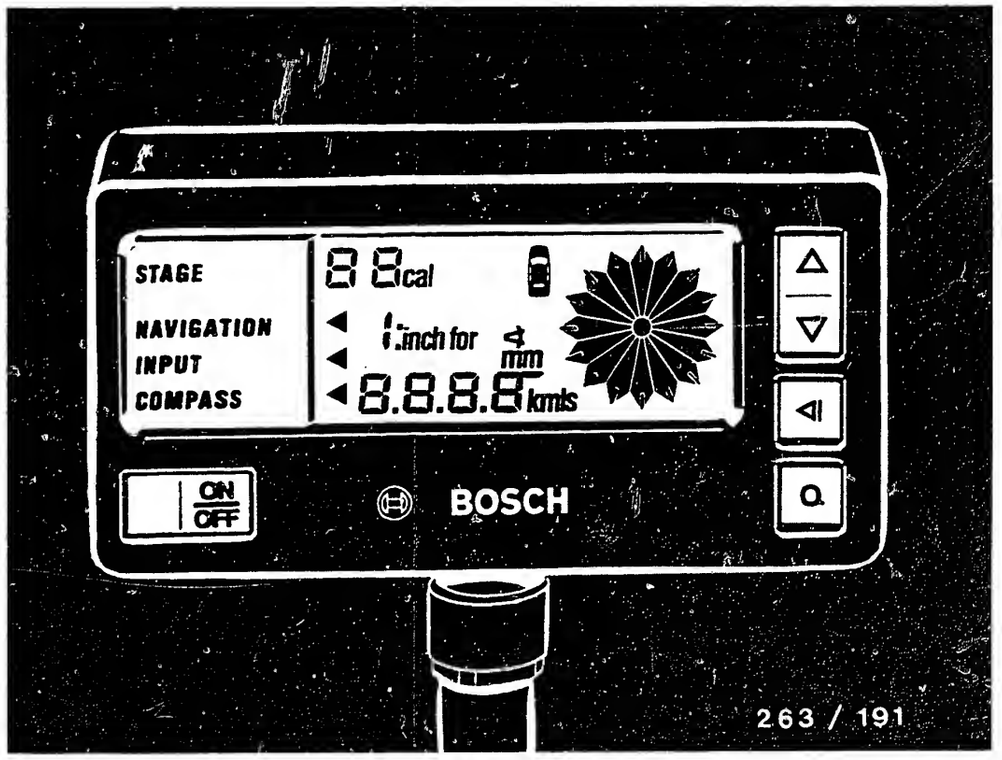



1 = On/off switch
2 = Upper pressure point of rocker for increasing numbers
3 = Lower pressure point of rocker for reducing numbers
4 = Key for moving menu cursor
5 = Enter key for inputs and actions
6 = Selector switch US/metric

The Car Pilot is operated with these 5 keys. With the rocker it is possible to change numerical values so as to make them higher or lower. A time-control facility allows the desired numerical value to be reached quickly.

Changeover from the metric to the imperial (US) system of dimensions is accomplished by means of a sliding switch which is let into the base of the housing.

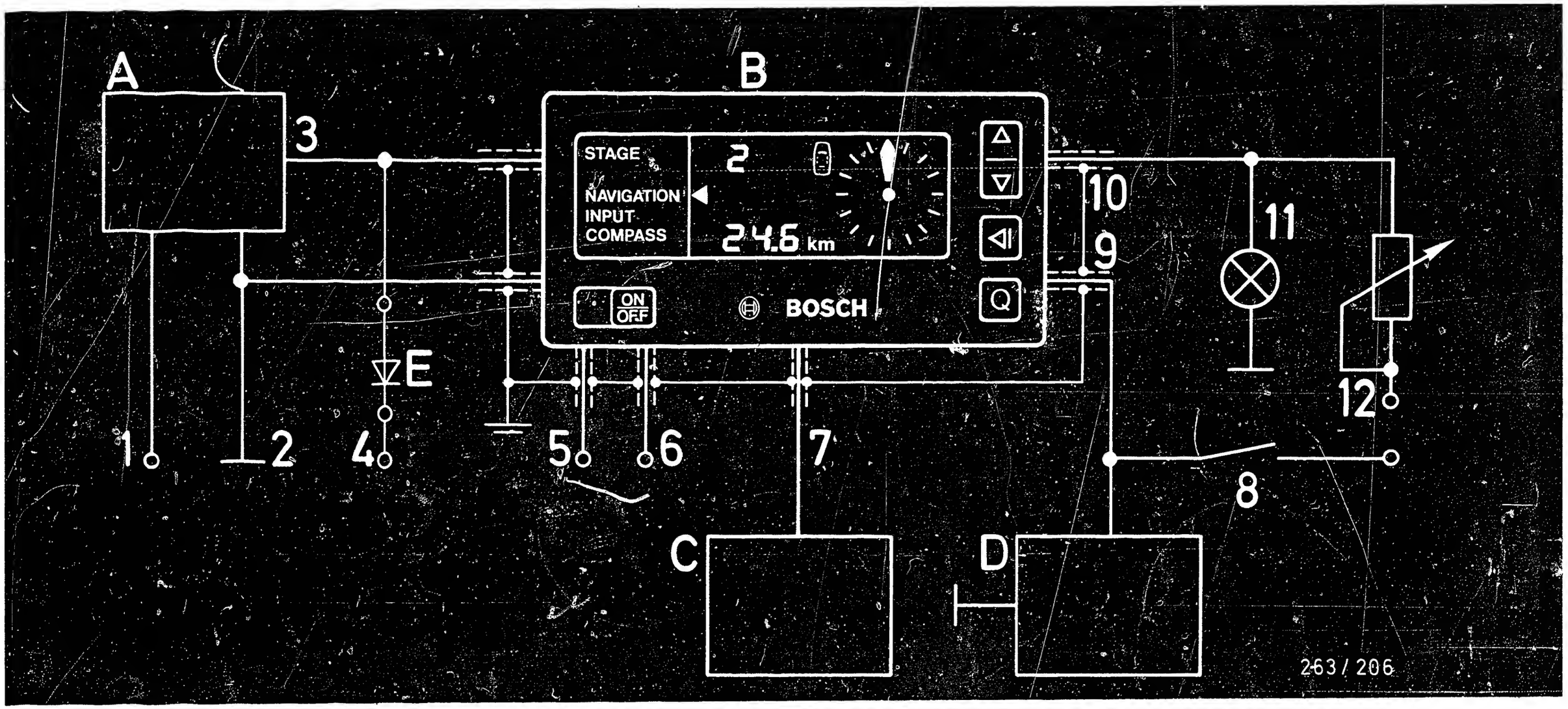





The information is output via a liquid-crystal display on which the data are displayed with seven-segment displays, characters and symbols (see picture).

Menu arrows point to the selected function.

The "Calibration" function (cal), which is not listed in the menu, is selected by pressing the rocker and the menu key simultaneously.




A = Distance transmitter
B = Display unit
C = Magnetic-field sensor
D = Interference consumer
E = Diode *

*Diode required only for Reed-contact distance transmitters not connected to a feedback-controlled electrical-system voltage.

1 = Term. 15
2 = Term. 31
3 = Signal from retrofitted distance transmitter
4 = Signal from installed distance transmitter
5 = Term. 30
6 = Term. 15 or term. R

7 = 4-pin connecting lead to magnet-field sensor, possibly with an extension
8 = Consumer switch
9 = ON/OFF signal from interference consumer
10 = Term. 58b
11 = Instrument lighting
12 = Term. 58

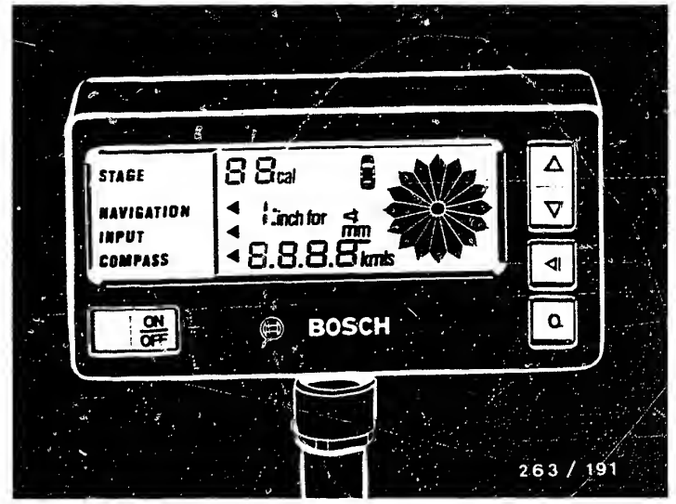
CIRCUIT DIAGRAM

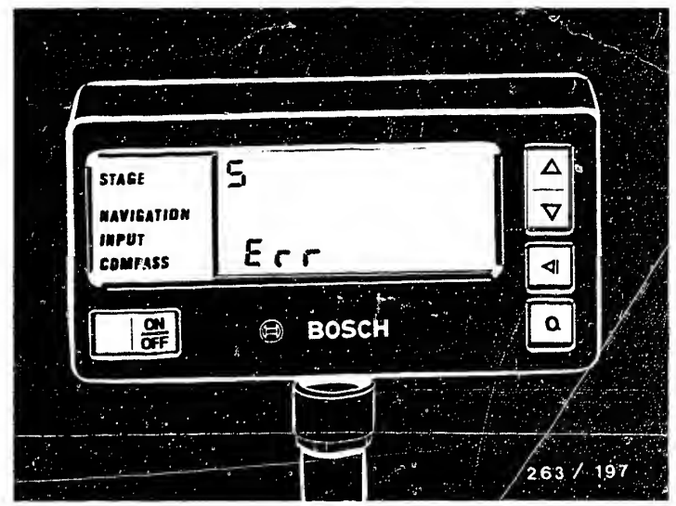
A07 — ⟹

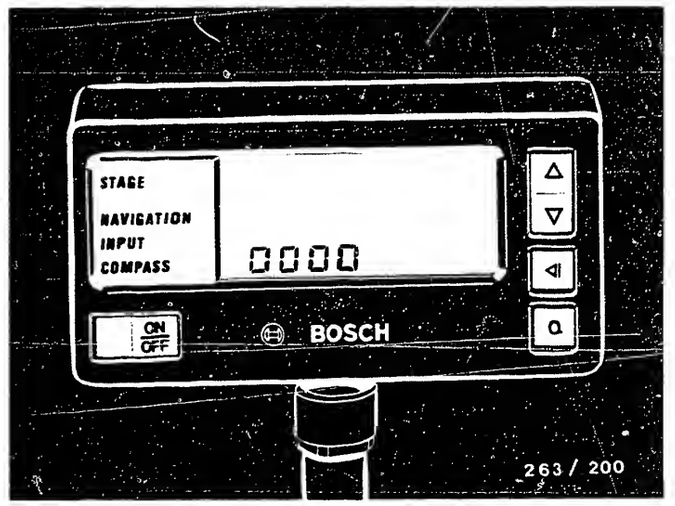
A08 — ⟸

RAPID DIAGNOSIS CHART

| Item | Fault | Casue of fault<br>How to rectify | Display on<br>Car Pilot | Coor-<br>dina-<br>tes |
|---|---|---|---|---|
| 1 | Keys do not function | Replace Car Pilot display unit | — | B17 |
| 2 | Partial failure of display | Call up check menu:<br>Car Pilot in compass menu<br>Press top rocker, MENU, bottom rocker, QUIT | All segments appear on display | B17 |
| 3 | Angle display not functioning or defective | *Magnetic-field sensor defective<br>Call up fault display<br><br>*Power supply (break in lead to sensor)<br>*Unit not (no longer) calibrated<br>*Magnetic-field sensor mounted on tailgate and poor ground connection<br>Corrective action:<br>ground strap from body to tailgate | <br><br>Fault number 1<br><br>Fault number 4 or 5<br><br>Fault number 1<br><br>Fault number 1 | B18 |
| 4 | Car Pilot has major navigational errors | *Additional distance impulses with lights "ON", low battery voltage or interfering ignition impulses<br>Call up check menu<br>Distance-impulse display:<br>Switch on lights<br><br>*Loose contact on distance sensor<br>Call up check menu<br>Drive same route | <br><br><br><br>Watch display<br><br><br>Watch display | B27 |

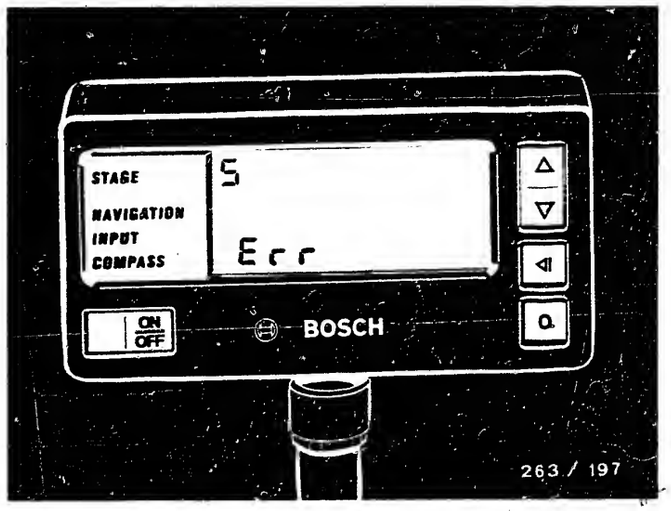


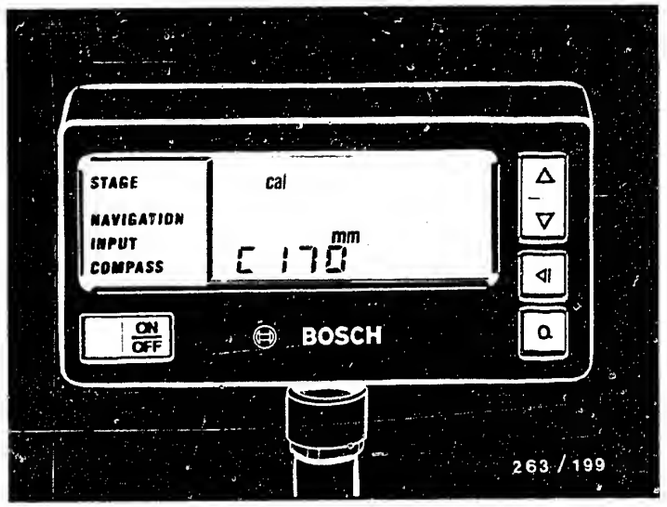



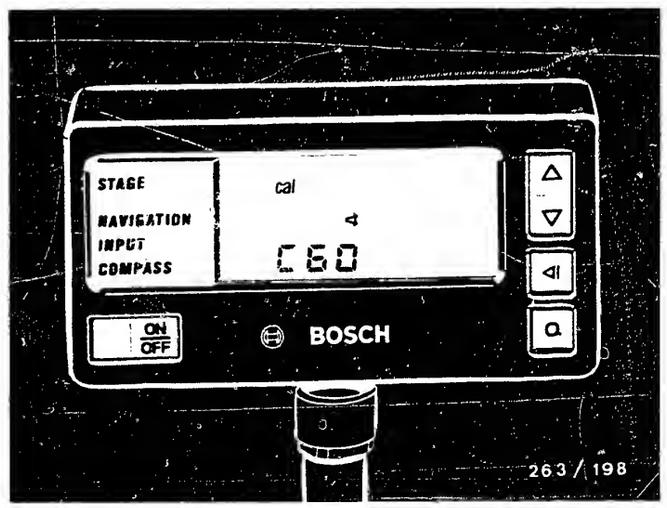



RAPID DIAGNOSIS CHART (continued)

| Item | Fault | Cause of fault<br>How to rectify | Display on Car Pilot | Coordinates |
|---|---|---|---|---|
| 4 | Car Pilot has major navigational errors | *Loose contact on magnetic-field sensor<br>Call up check menu | Fault number 4 or 5 | B19 |
| | | *Unit not or poorly calibrated<br>Make note of distance and angle reference numbers with vehicle stationary. Compare with distance and angle reference numbers in angle report.<br>Drive in a circle. If still poor, then calibration of distance and angle reference numbers | Incorrect distance or angle reference number | B23<br>C05 |
| | | *Internal defect in Car Pilot<br>Call up check menu and call up faults | Fault number on display 7, 8 or 9 | B21 |
| | | *Interference consumer not calibrated with unit or break in cable<br>Perform new calibration trip (drive in circle) with interference consumer | Fault number 3 | B19 |
| | | *With sensor in luggage compartment and metal objects moving in luggage compartment (tool box).<br>Secure tool box or other moving parts. | ——— | |

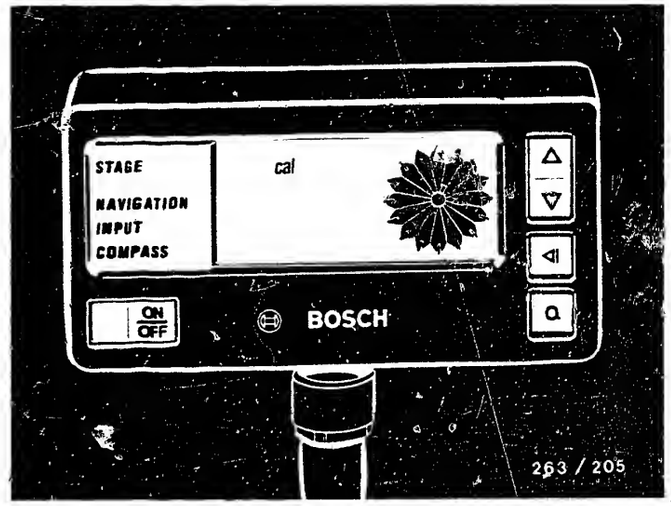


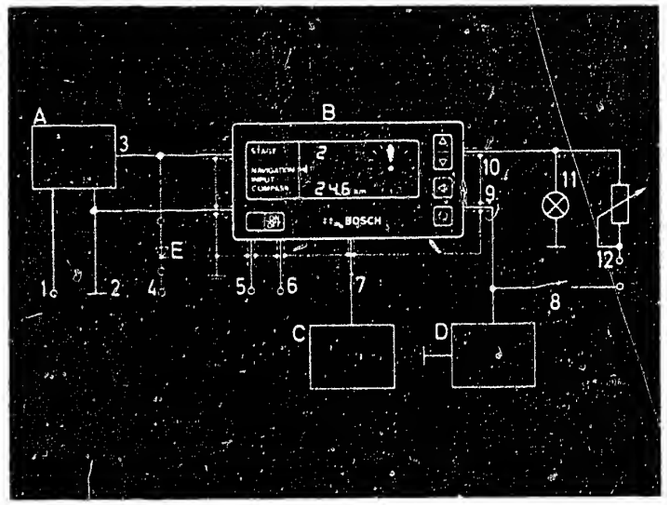



RAPID DIAGNOSIS CHART (continued)

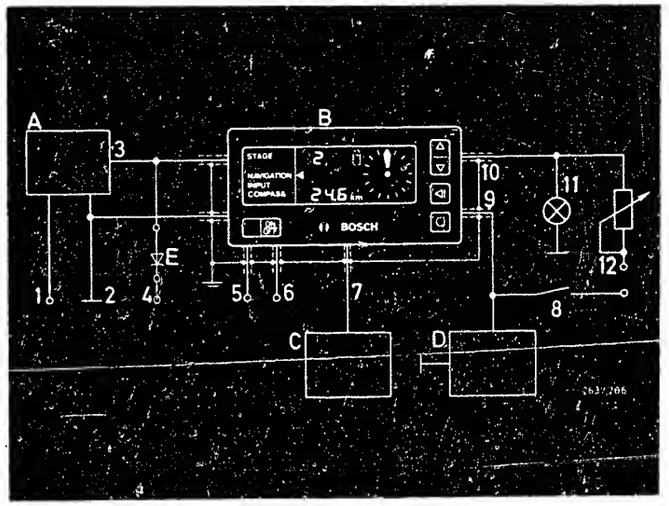
| Item | Fault | Cause of fault<br>How to rectify | Display on Car Pilot | Coordinates |
|---|---|---|---|---|
| 4 | Car Pilot has major navigational errors | *With sensor in passenger compartment and e.g. moving magnetic mascot e.g. on mirror<br><br>Remove moving magnetic part<br><br>*In case of trips over 300 km long and with system off<br><br>Drive in circle again | ——— | C05 |
| 5 | Night-time reduction not controllable | *Display unit incorrectly connected<br><br>Check connection of night-time reduction and correct | ——— | B17 |
| 6 | Arbitrary changeover to night-time reduction | *Voltage drop across body<br><br>Connect diode between brake switch and stop lamp. Anode of diode to switch | ——— | B17 |
| 7 | Radio interference | *Shielding of swan-neck has poor ground, or the cable length of the shielding has been changed. | ——— | B17 |

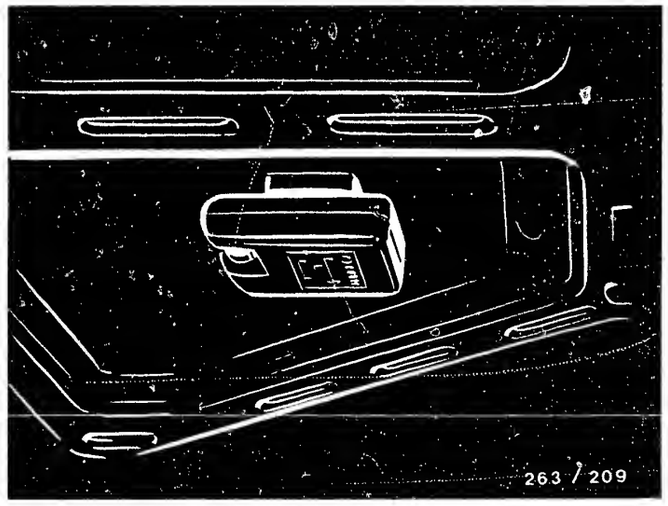


RAPID DIAGNOSIS CHART

| Item | Fault | Cause of fault<br>How to rectify | Display on Car Pilot | Coordinates |
|---|---|---|---|---|
| 7 | Radio interference (continued) | Make good ground connection (directly on to body metal). Leave cable length of shielding unchanged | ——— | B17 |
| | | *Joint power supply to Car Pilot and radio<br><br>Provide separate power supply | ——— | |
| | | *Length of leads at term. 30, term. 15 and term. 31 too long<br><br>Correct lengths of leads | ——— | |
| | | *Unfavorable installation of antenna e.g. windshield antenna or active antenna on front side of vehicle<br><br>Installation of antenna at rear of vehicle | ——— | |
| 8 | Magnetic-field sensor drops off | *Adhesive bonded at incorrect temperature (below 18°C) or bonding location dirty.<br><br>Replace adhesive film under magnetic-field sensor. Make sure that base is free of grease and that ambient temperature is above 20°C. | ——— | C05 |



RAPID DIAGNOSIS CHART

| Item | Fault | Cause of fault<br>How to rectify | Display on<br>Car Pilot | Coor-<br>dina-<br>tes |
|---|---|---|---|---|
| 9 | Car Pilot cannot be calibrated | Check installation position of magnetic-field sensor<br><br>* In compass menu, select display of magnetic-field strength.<br><br>Slowly drive in a circle with vehicle.<br><br>If strength is not constant, i.e. if the display jumps while driving in a circle, the installation location is unsuitable. | ———<br><br>———<br><br>Values on the display must rise or fall steadily between the minimum and maximum values. | C07 |

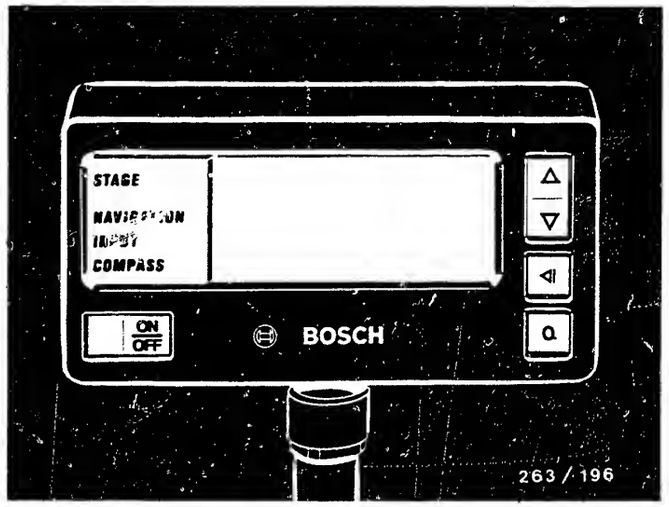
TEST EQUIPMENT AND TOOLS

| | | |
|---|---|---|
| Multimeter | ETE 014.00 | 0 684 101 400 |
| or e.g. Pontavi | | Commercially available |
| 2 test leads, e.g. | | KDES 0002 |

For production reasons:
continued on the following
coordinate.

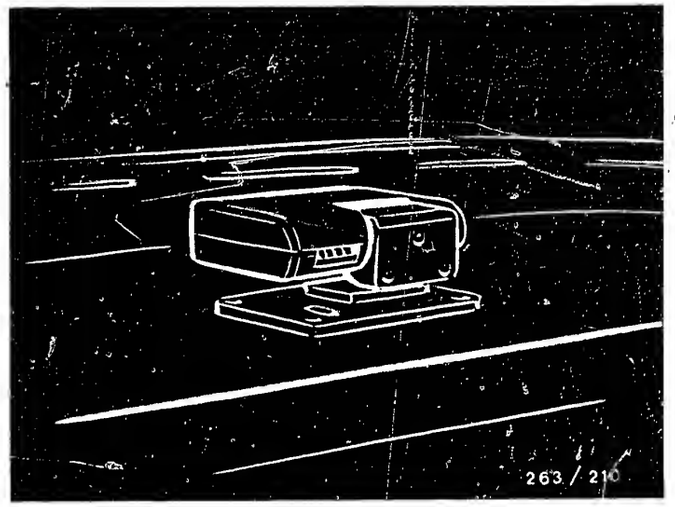
INSTALLATION POSITION OF COMPONENTS

The display unit of the Car Pilot is in the passenger compartment in the field of vision of the driver.



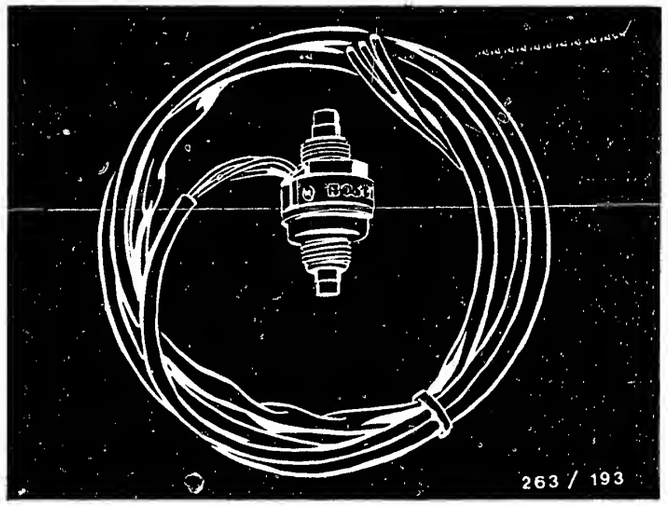

The magnetic-field sensor is in the previously established most favorable installation position for the system, e.g.

* Vehicle roof
* Luggage-compartment lid (inside)
* Rear parcel shelf
* Above interior mirror on windshield or on rear window at the top




Distance-impulse transmitter

* Supplied distance-impulse transmitter in speedometer shaft
* Otherwise vehicle's own distance impulses from transmitters in the vehicle e.g. Reed contacts, photoelectric light barrier, Hall sensor or induction-type transmitter.



TROUBLE-SHOOTING

* How to use the self-diagnosis

This system has a self-diagnosis feature.

Therefore, whenever testing, start with the self-diagnosis.

How to activate the self-diagnosis is described on Coordinate B01.

The self-diagnosis/test table starting on Coordinate B05 contains fault indication, cause of fault, test instructions and coordinate references for direct trouble-shooting.
If, during the self-diagnosis, no fault is indicated and the customer complaint is still not remedied, continue trouble-shooting with the trouble-shooting chart on B09.

SELF-DIAGNOSIS

The system contains a SELF-TEST as well as a FAULT INDICATION

<u>SELF-TEST</u>

The system is able to test itself. During operation, however, it is not possible for all functions constantly to be checked.
For this reason, the self-test has been sub-divided.

The following are constantly monitored:

* Magnetic-field sensor and

* if applicable, quality / correctness of magnetic-field calibration.



For production reasons:
continued on the following coordinate.

SELF--DIAGNOSIS

Each time the system is switched on, the test is performed for

* read-only memory (EPROM).

Each time term. 30 is connected, the

* random access memory (RAM) is tested.

In addition, it is also possible for the test menu to be called up in order to test the

* non-volatile random access memory (EEPROM) and the
* distance sensor.

<u>Test conditions:</u>

* Vehicle stationary

* Switch on system

* System in compass menu

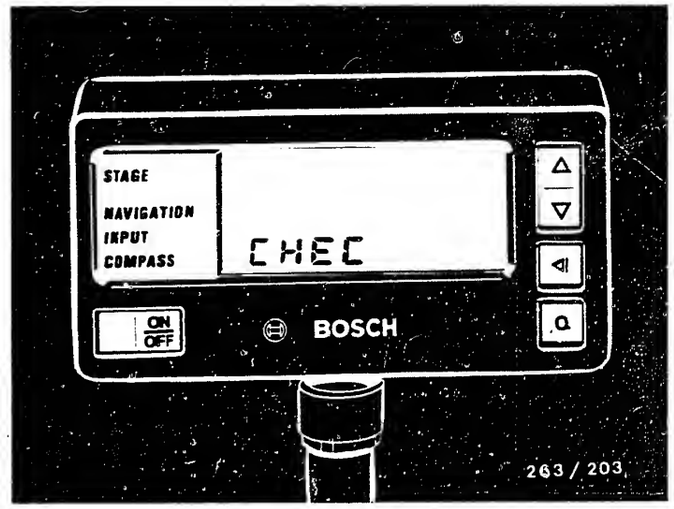
Press the following four keys in the correct order:

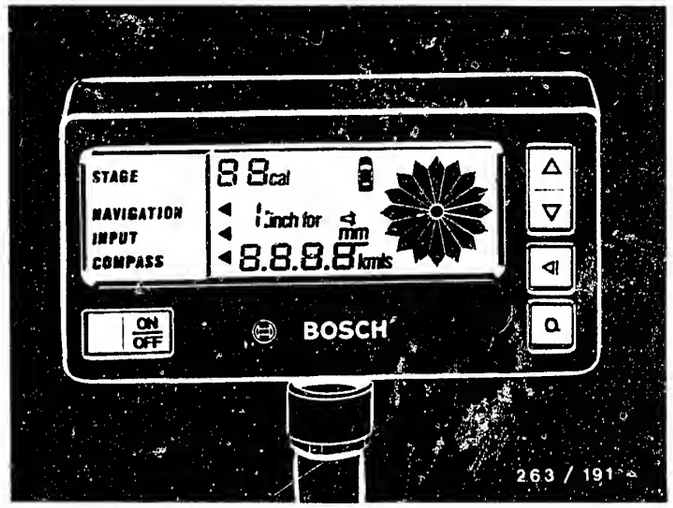
* Top rocker, MENU, bottom rocker, QUIT

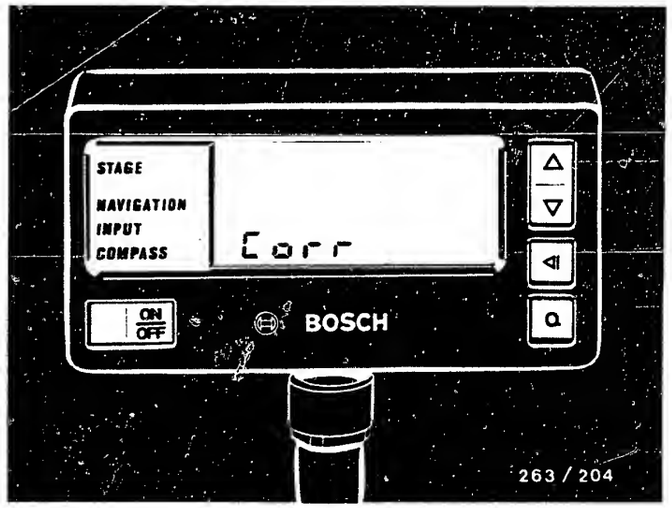
After the keys have been pressed in this sequence, the menu arrow disappears and the symbol CHEC flashes on the seven-segment display.

After the "Quit key" has been pressed, all segments appear. The segments remain in the display until the "Quit key" is pressed again.

Now the EEPROM is tested. (Data are kept) in case the system is not switched off during the test. If the test is successful, the system then shows CORR or a fault number (fault with highest priority).



SELF-DIAGNOSIS (CONTINUED)

After the display has been acknowledged (press QUIT key), the distance-impulse display is shown. With the vehicle stationary, the display shows "0000".

Distance impulses are now produced:

* By turning the sensor shaft
* By short-circuiting the distance-signal cable to ground
* Or by driving the vehicle
* Turning the wheel on which the sensor is situated
* Poor ground connection
* Vehicle lighting switched on (night-time reduction activated) and unfavorable routing of cables, the sum of the impulses measured is indicated.

The "QUIT" key is used to reset to 0; the Menu key is used to abort the test.

Resetting the system to its original condition is possible if, before pressing "QUIT", the bottom rocker is pressed and is held down for approx. 5 seconds together with the QUIT key.

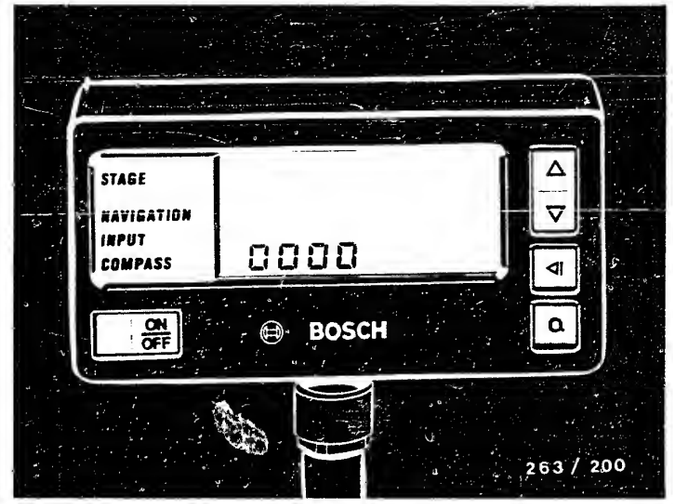
"BYE" flashes on 7-segment display.

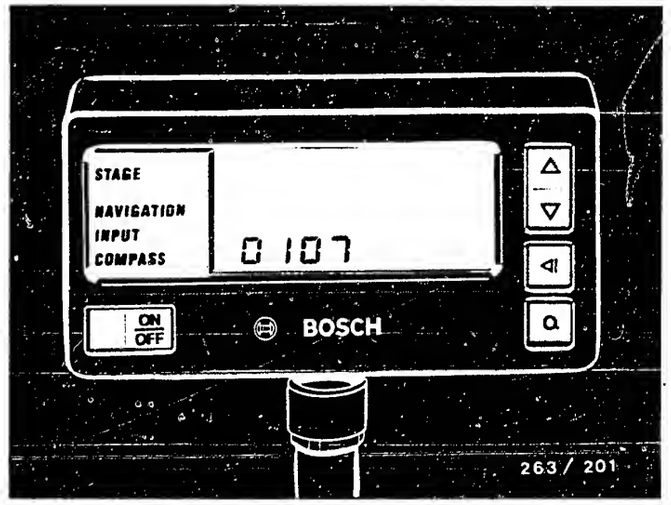
Caution: After pressing "QUIT", the entire system is now changed into virgin condition; this means that EEPROM and RAM are erased. BYE. display no longer flashes. Switch off system and switch on again

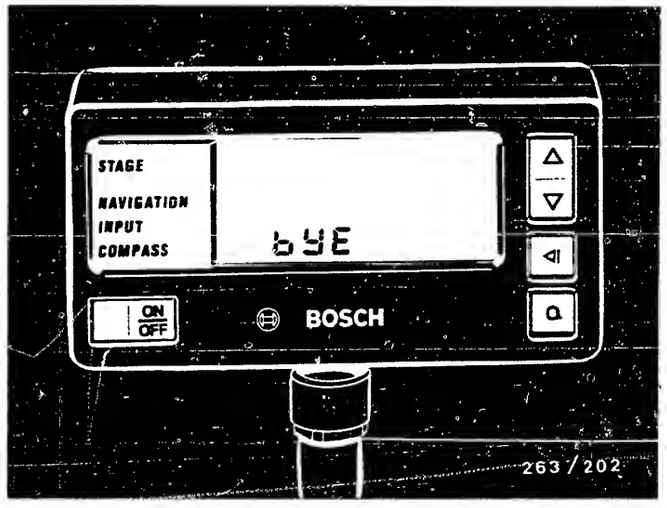
Then, in any case, perform a new calibration trip.

FAULT INDICATION

Various system-internal faults can be indicated. With the exception of faults 1, 2 and 3, which are indicated only after driving in a circle, after a calibration menu has been run, the fault number is indicated in the left-hand number of stages and "Err" is indicated on the 4-digit display.



SELF-DIAGNOSIS (CONTINUED)

Fault-indication table

| Fault number | Cause of fault | Component | Test instructions with test specifications | Test step/ Coordinate |
|---|---|---|---|---|
| 1 | Full circle not driven | Magnetic-field sensor | Repeat driving in a circle | C05 |
| 2 | Unfavorable installation position for magnetic-field sensor | Magnetic-field sensor | Check installation position of magnetic-field sensor again. Magnetic-field strength on display unit should not be greater than 50 A/m for one rotation of the magnetic-field sensor. | C05 |
| | Unsuitable place for calibration trip (disturbing iron parts, street on incline) | | Repeat driving in circle on horizontal location, not near large iron parts (tank installations etc.). | C05 |
| 3 | Consumer was switched on/off when driving in a circle | Consumer | If applicable, repeat driving in a circle without consumer and then switch consumer (i.e. SWITCH ON or OFF when asked to do so). Vehicle must be stationary. | C05 |
| 4 | Magnet-field sensor produces nonsense readings | Magnetic-field sensor | Occurs usually when system has been re-connected to battery. To rectify, switch off system and then on again. If fault still present, fault in wiring harness or magnetic-field sensor defective. | C05 |
| 5 | Magnetic-field sensor not connected, open circuit or loose contact in connecting lead between magnetic-field sensor and display unit | Magnetic-field sensor | Car Pilot in calibration menu. Disturb magnetic-field sensor with magnet.<br>Then the old value (before disturbance) must appear on the display in A/m.<br>The angle display does not change in the calibration menu. | C05 |

SELF–DIAGNOSIS (CONTINUED)

Fault–indication table

| Fault number | Cause of fault | Component | Test instructions with test specifications | Test step/ Coordinate |
|---|---|---|---|---|
| 6 | Not occupied | ——— | ——— | ——— |
| 7 | EEPROM fault | Display unit | Fault indicated in check menu. Replace display unit. | B17 |
| 8 | RAM fault | Display unit | Fault indicated in check menu. Disconnect term. 30/re–connect. Call up check menu. If fault present, replace display unit. | B17 |
| 9 | ROM fault | Display unit | Fault indicated in check menu. Replace display unit. | B17 |

TROUBLE-SHOOTING CHART

Customer complaint (fault symptoms)
The below-listed fault symptoms may be due to one or more faults.

1. No display on Car Pilot.
2. One or more segments on Car Pilot not being energized.
3. Cursor on Car Pilot cannot be moved with Menu key.
4. Quit key not functioning.
5. Number of stages cannot be increased or reduced with rocker.

| | | | | | Trouble-shooting | Coordinates |
|---|---|---|---|---|---|---|
| * | | | | | No power supply term. 30 (fuse defective) | B17 |
| * | | | | | No power supply term. 15 or ground | B17 |
| | | * | | | Display unit defective | B17 |
| | | * | * | * | Keyboard defective | B17 |
| | * | | | | Display defective | B17 |
| | | * | | | Non-abortable function called up e.g. calibration trip | B17 |
| | | | * | | Non-QUIT function called up or not pressed long enough (in navigation menu). Stage 0 or 99 selected | B17 |

B11 — ⟹

TROUBLE-SHOOTING CHART (CONTINUED)

Customer complaint (fault symptoms)
The below-listed fault symptoms may be due to one or more faults.

6. Kilometer display on unit does not decrease as vehicle moves toward destination.
7. After input, system shows nonsense readings.
8. Compass points in the wrong direction and turns with direction of travel.
9. Linking of different stages not functioning.
10. Display test not functioning.

| | | | | | Trouble-shooting | Coordinates |
|---|---|---|---|---|---|---|
| * | | | | | Distance transmitter defective | B23 |
| | | * | | | Magnetic-field sensor installed wrong way up | C05 |
| | | | | * | Display unit defective | B17 |
| * | | | | | Stage not activated (no arrow indication) | A09 |
| * | | | | | Vehicle moving away from destination (opposite) | A09 |
| | * | | | | Stages are linked. Rosette input not possible. | B17 |
| | * | | * | | Stages have not been programmed in continuous manner. | B17 |
| | * | | | | US selector switch in wrong position | A05 |
| | | | * | | 9th stage of trip has not been programmed | B17 |
| * | | | | | Vehicle has Reed-contact transmitter that is not connected to feedback-controlled combination voltage. | B23 |

B12 — ⟸⟹

TROUBLE-SHOOTING CHART (CONTINUED)

Customer complaint (fault symptoms)
The below-listed fault symptoms may be due to one or more faults.

11. Self-test cannot be called up.

12. Distance changes when vehicle is stationary and headlamps are on.

13. Vehicle lighting on, lighting potentiometer in min or max position. Display lit brightly.

14. Vehicle lighting off, display dark at times.

15. Radio interference.

16. System cannot be calibrated (fault 2).

| | | | | | | Trouble-shooting | Coordinates |
|---|---|---|---|---|---|---|---|
| * | | | | | | Select compass menu and switch system on/off. | B17 |
| | * | | | | | Poor ground connection (system and distance transmitter not to common ground). Lead term. 31 too long. | B17 |
| | | * | | | | Brightness pot defective, poor contact. | A13 |
| | | | * | | | High voltage drop across ground on body. | A13 |
| | | | | * | | Shielding not directly connected to vehicle metal | A13 |
| | | | | * | | Shielding has been shortened or lengthened | A15 |
| | | | | * | | Vehicle has windshield antenna. | A15 |
| | | | | | * | Unsuitable installation location (Magnetic-field sensor). | C07 |
| | | | | | * | Unsuitable calibration location. | C07 |

B13 — <==

For production reasons: continued on the following coordinate.

B14 — => <=

For production reasons:
continued on the following
coordinate.



TROUBLE-SHOOTING ACCORDING TO TEST STEPS

* C o n d i t i o n s

* Check customer complaints
  (Check operation of Car Pilot according
  to operating instructions).

* Electrical system (fuses, battery voltage) O.K.

* Car Pilot installed according to installation
  instructions.

* Both calibration trips performed.

When performing detailed trouble-shooting starting on Coordinate B17, go through the test steps one after the other.

Only if fault is indicated, proceed with the trouble-shooting in the right-hand column.

Test step 1

Check display unit:

* Disconnect term. 30 from display unit and re-connect.
* Call up test menu.

To do this, (after switching on and before any other key is pressed) the four keys "top rocker, MENU, bottom rocker, QUIT" must be pressed and released again in precisely this order. For this, the system is in the compass menu.
The symbol CHEC flashes on the seven-segment display.
Press Quit key; all display elements now appear on the seven-segment display. After viewing, press Quit key again; the symbol CHEC again appears for approx. 2 seconds.
In these 2 seconds the EEPROM is tested. If the test is successful, the symbol Corr appears on the display unit; otherwise, the corresponding fault number appears. If nothing appears on the seven-segment display, or if a fault number is indicated, proceed according to the trouble-shooting on the right-hand side.

N>

Trouble-shooting - test step 1

* Check lead from term. 15 to display unit term. 5.

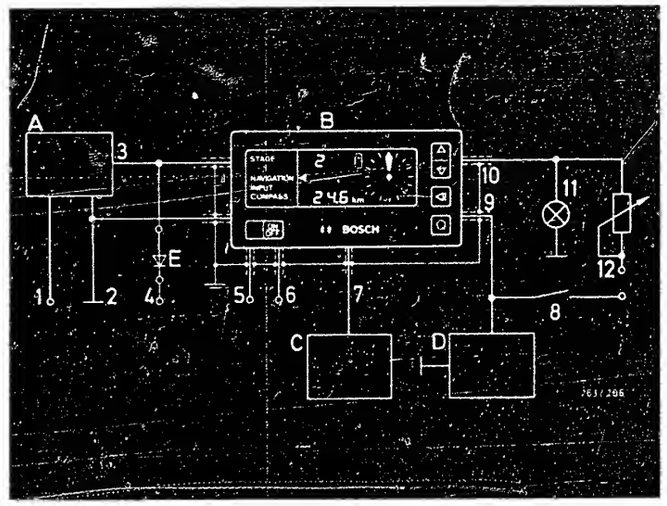
* Check lead from term. 30 to display unit term. 4.

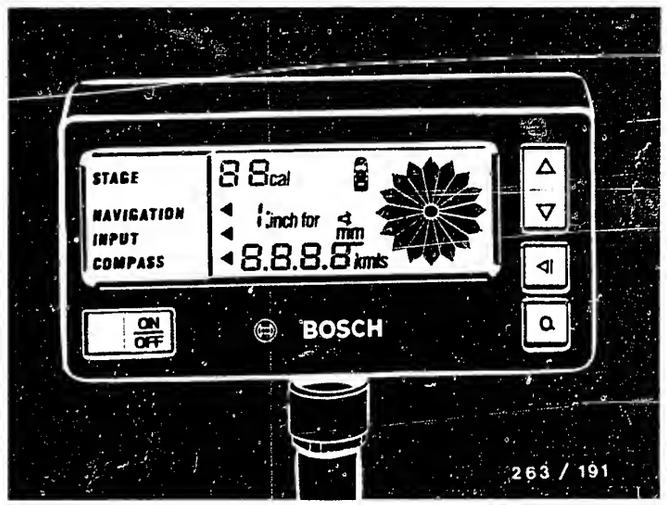
* Check lead from term. 31 to display unit term. 2.

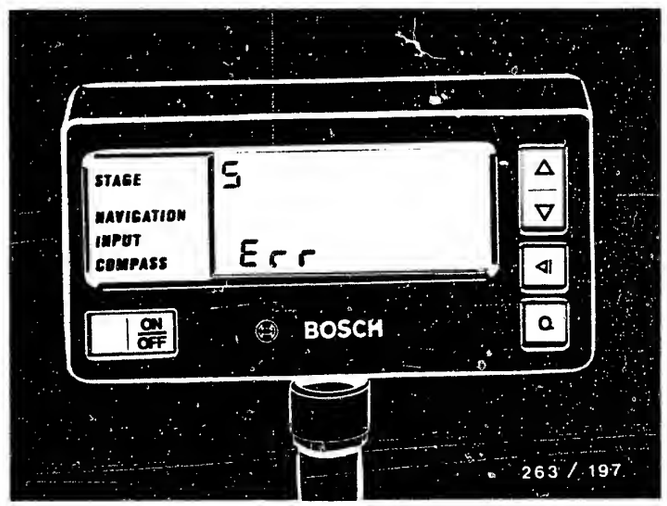
Eliminate open circuit or contact resistances on the leads.

If a fault number is indicated, continue on next page.

After replacing the display unit, it is necessary to perform a complete calibration trip (distance and angle).

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Trouble-shooting – test step 1 (continued 1)

Fault-indication table

| Fault number | Cause of fault | Component | Test instructions with test specifications |
|---|---|---|---|
| 1 | Full circle not driven | Magnetic-field sensor | Repeat driving in a circle |
| 2 | Unfavorable installation position for magnetic-field sensor<br><br>Unsuitable place for calibration trip (disturbing iron parts, street on incline) | Magnetic-field sensor | Check installation position of magnetic-field sensor again. Magnetic-field strength on display unit should not be greater than 50 A/m for one rotation of the magnetic-field sensor.<br><br>Repeat driving in circle on horizontal location, not near large iron parts (tank installations etc.). |
| 3 | Consumer was switched on/off when driving in a circle | Consumer | If applicable, repeat driving in a circle without consumer and then switch consumer (i.e. SWITCH ON or OFF when asked to do so). Vehicle must be stationary. |
| 4 | Magnet-field sensor produces nonsense readings | Magnetic-field sensor | Occurs usually when system has been re-connected to battery. To rectify, switch off system and then on again. If fault still present, fault in wiring harness or magnetic-field sensor defective. |
| 5 | Magnetic-field sensor not connected, open circuit or loose contact in connecting lead between magnetic-field sensor and display unit | Magnetic-field sensor | Car Pilot in calibration menu. Disturb magnetic-field sensor with magnet.<br>Then the old value (before disturbance) must appear on the display in A/m.<br>The angle display does not change in the calibration menu. |

Trouble-shooting – test step 1 (continued)

Fault-indication table

| Fault number | Cause of fault | Component | Test instructions with test specifications |
|---|---|---|---|
| 6 | Not occupied | | |
| 7 | EEPROM fault | Display unit | Fault indicated in check menu. Replace display unit. |
| 8 | RAM fault | Display unit | Fault indicated in check menu. Disconnect term. 30/re-connect. Call up check menu. If fault present, replace display unit. |
| 9 | ROM fault | Display unit | Fault indicated in check menu. Replace display unit. |

V

Test step 2

<u>Checking the distance signal:</u>

Switch on ignition
Switch on display unit
* Call up test menu

To do this, (after switching on and before any other key is pressed) the four keys
"top rocker, MENU, bottom rocker, QUIT"
must be pressed and released again in precisely this order.
For this, the system is in the compass menu.
The symbol CHECK flashes on the seven-segment display.
Press Quit key; all display elements now appear on the seven-segment display. After viewing, press Quit key again; the symbol CHEC appears again for approx. 2 seconds. In these 2 seconds, the EEPROM is tested. If test is successful, the symbol CORR appears on the display unit; otherwise, the fault number appears.

By pressing Quit, you come to the distance-impulse display. The display shows 0000 with the vehicle stationary (bottom picture).

N>

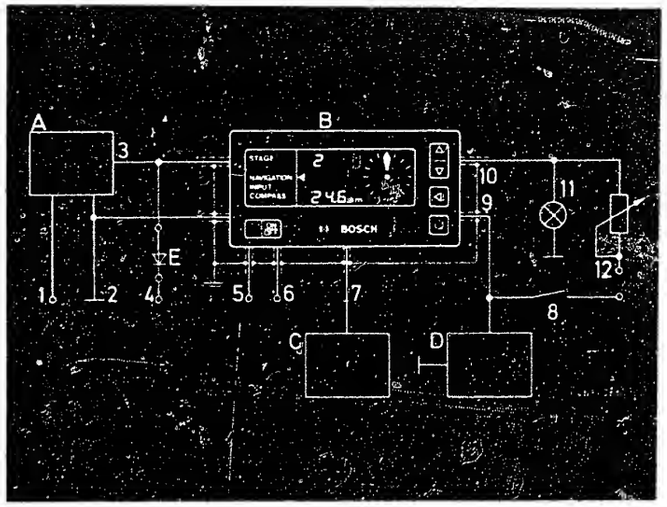
<u>Trouble-shooting - test step 2:</u>

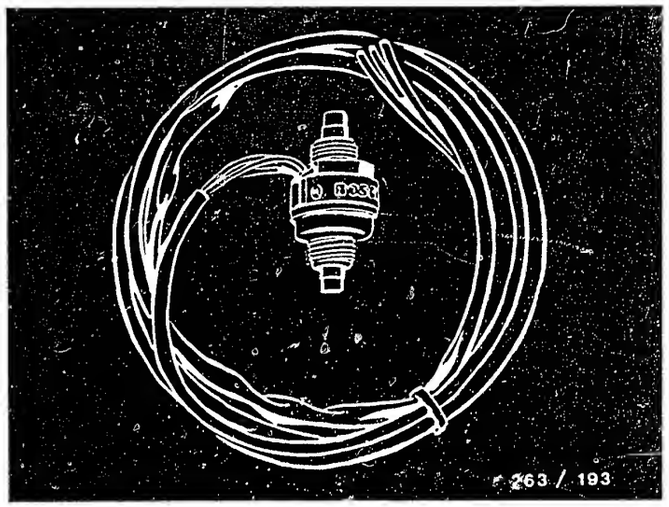
Switch off ignition

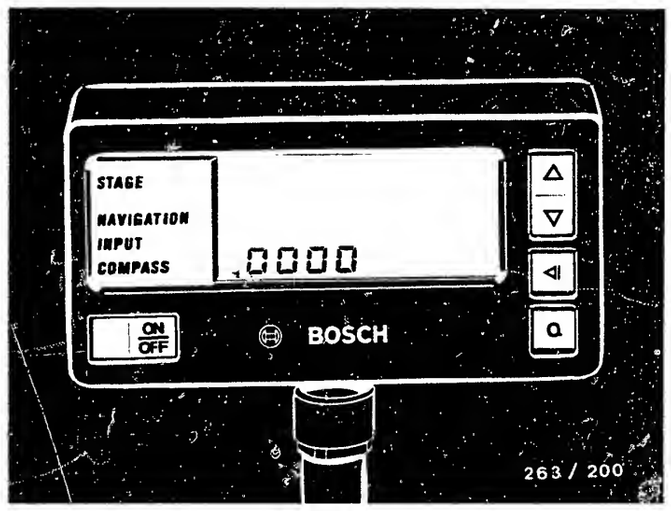
1. Check retrofitted distance-impulse transmitter
0 355 540 ..

* Switch on display unit.
Connect blue/red lead of distance-impulse transmitter to multimeter (voltage measurement).
Move vehicle very slowly.
If pointer on instrument deflects, distance-impulse transmitter is O.K.
* Otherwise, perform voltage measurement on the two other leads of the distance-impulse transmitter.
Set value: 0 V or U Batt.

If, despite supply voltage being applied, distance-impulse transmitter does not supply any distance impulses, replace the distance-impulse transmitter.




Y

V

Continued on next picture page

Test step 2 (continued 1))

Move vehicle; the impulses occurring must now be counted on the display.

The display can be reset with the Quit key.

The test can be aborted wth the Menu key.

Distance impulses detected?

N>

Y

Trouble-shooting - test step 2 (continued 1):

Check vehicle-specific distance transmitters:

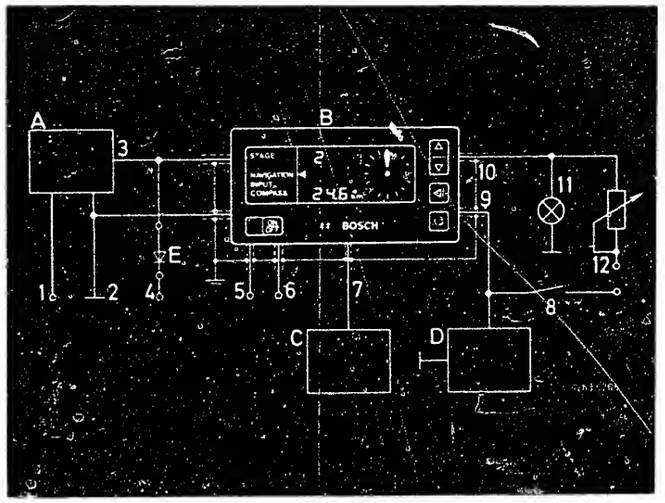
* Connect voltmeter to distance-transmitter leads
  Measuring range 16V
* Switch on term. 15
* Move vehicle by one wheel revolution

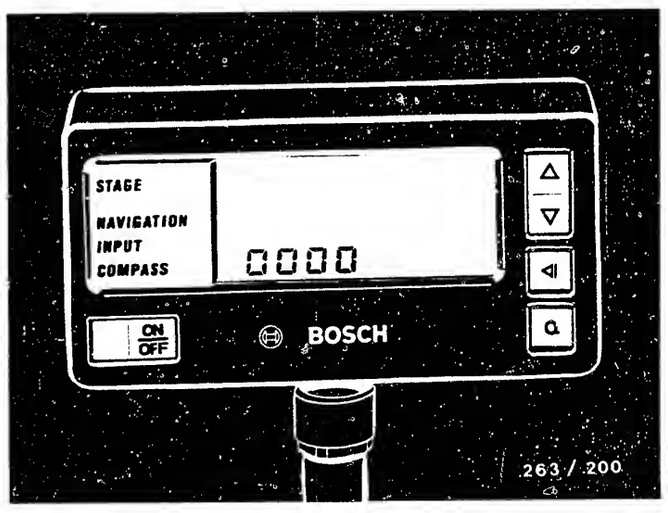
1. Induction-type transmitter

* During the movement of the vehicle, the voltage does not fluctuate between approximately 0 V and 12 V
* Switch off terminal 15
* Measure again on distance transmitter
  Measuring range = 0.2 V
* Move vehicle
  Brief reading on voltmeter while vehicle is moving

If the reading is not briefly visible on the voltmeter, distance transmitter is defective.

Replace defective distance transmitter

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Test step 2 (continued 2)

With lights on, no distance impulses are detected with the vehicle stationary.

N>

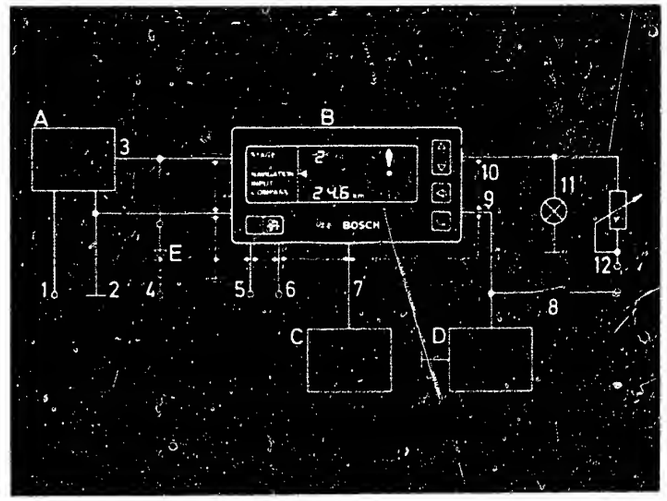
Trouble-shooting – test step 2 (continued 2)

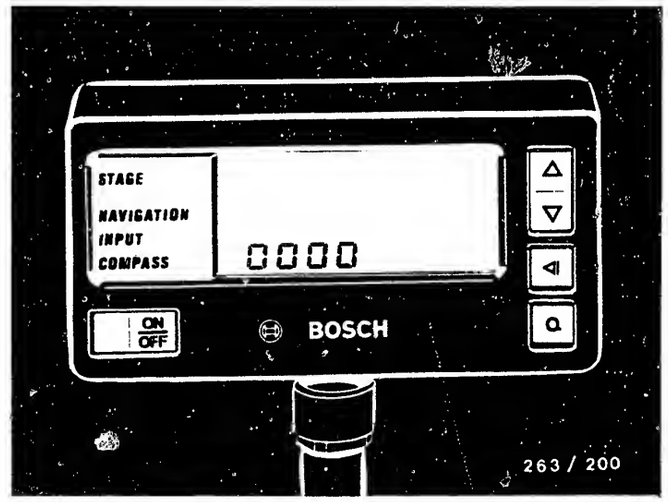
* Vehicle ground and distance-transmitter ground not connected to the same ground point.

* Shielding not connected to ground.

* Vehicle with Reed-contact transmitter:

  Transmitter not connected to stabilized supply voltage e.g. 5V or 10V.

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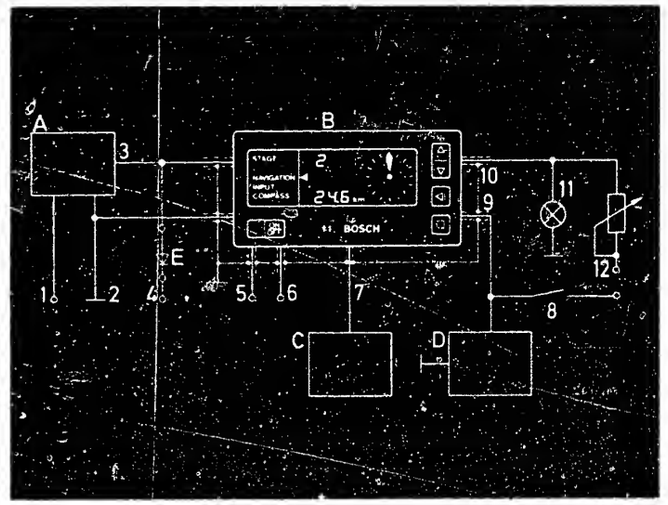



## Trouble-shooting – test step 2 (continued 3)

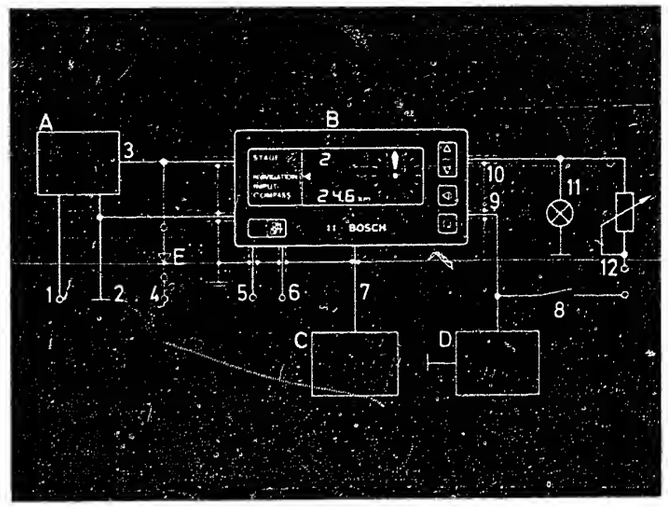
2. Reed-contact transmitter

* During testing, the reading on the voltmeter fluctuates between approximately 0 V and 12 V
* Repeat test at the transmitter pins.
  Switch off terminal 15
  On the measuring instrument, switch from voltage measurement to resistance measurement
* Move vehicle
  Reading on ohmmeter between 0 Ω and greater than or equal to 1 k Ω

If no reading on ohmmeter, distance transmitter is defective.

Replace defective distance transmitter

Continued on next picture page




Trouble-shooting – test step 2 (continued 4)

3. Hall or optical transmitter

* During testing, the reading on the voltmeter fluctuates between approximately 0 V and 12 V
* Repeat test at the transmitter pins.
  Switch off terminal 15
  On the measuring instrument, switch from voltage measurement to resistance measurement
* Move vehicle
  Reading on ohmmeter between 0 Ω and greater than or equal to 1 k Ω
* While the vehicle is being moved, the reading remains at greater than or equal to 1 k Ω

If reading on ohmmeter less than 1 k Ω , distance transmitter is defective.

Replace defective distance transmitter

Continued on next picture page

V

Test step 3

Check magnetic-field sensor:

* Switch on display unit (after term. 30 on, wait 1 min).
* Select compass with menu key
* Press Quit key for 5 sec

* "HELP" appears on display

* Press Quit key

No fault number appears

N>

Trouble-shooting - test step 3

Fault 5
Switch off ignition

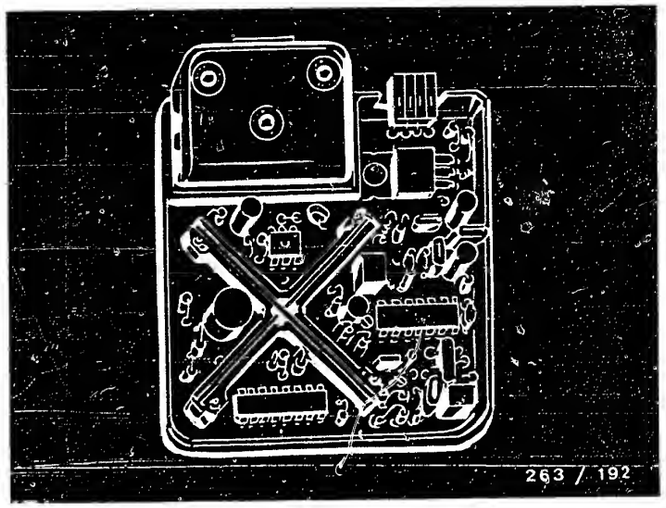
*Check 4-pin connecting lead from magnetic-field sensor to display unit. If lead is extended, also check plug-in connector.

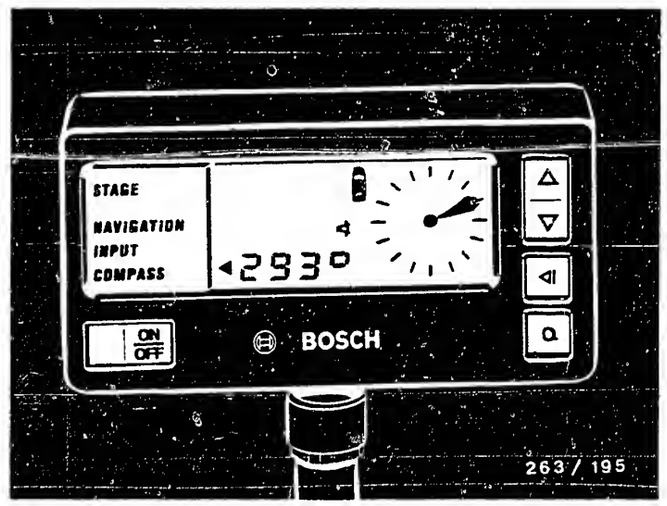
Eliminate open circuit or contact resistances at the leads or plug-in connectors.

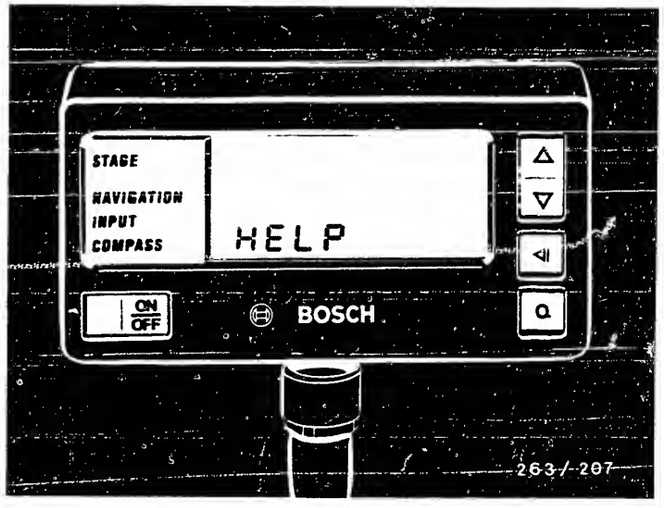
*Remove magnetic-field sensor
*Supply magnetic-field sensor externally with voltage with voltage stabilizer (top picture).
*Connect voltmeter $R_i$ greater than or equal to 20 k Ω /V according to test circuit
*Apply 5 V or 0V alternately at input SU. Turn sensor through 360° (voltage change approx. 1V)

If voltage is not within the required tolerance range, replace the magnetic-field sensor.
If magnetic-field sensor is O.K., replace display unit.

After replacing the magnetic-field sensor or the display, it is necessary to perform a complete calibration trip.

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Test step 3 (continued)

<u>Check installation position of magnetic-field sensor:</u>

* Switch on display unit (after term. 30 on, wait 1 min).

* Select compass with menu key.

* Press top rocker and hold down; at the same time, press key for moving menu cursors.
  Display shows flashing cal.

* Press Quit key; the magnetic-field strength is indicated.

* Slowly drive vehicle in a circle. Values on the display must fall or rise steadily between minimum and maximum values.

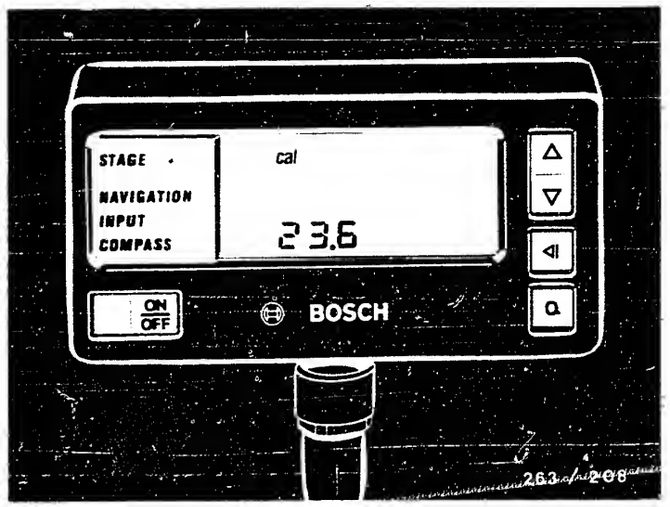
* If fall/rise not steady, i.e. if the display jumps while driving in a circle, the installation position is unsuitable.

  Value moves continuously in one direction.

N>

Trouble-shooting – test step 3 (continued 1)

Check installation position of magnetic-field sensor again. Repeat driving in circle on horizontal location, not near large iron parts (tank installations etc).



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